



GE VERNOVA

**PROFICY® SOFTWARE & SERVICES**

# SENSOR HEALTH

Getting Started

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# Introduction

## Overview of Sensor Health

Analog sensors are critical in modern manufacturing as they provide the 'Heartbeat' signals for equipment and processes. Sensor data quality plays a vital role in Industrial Internet of Things (IIoT) applications, as equipment is useless if the data quality from the sensors is bad.

Due to their electromagnetic, electrochemical and/or mechanical nature, over time, sensors can start to show various defects. It is essential that sensor data gets validated to avoid defects, and that reactions are triggered when defects can potentially impact the equipment as well as the product outcome.

Sensor Health is the solution by which each of the individual sensors can be monitored for anomalies. Thus, essentially, it's a univariate analytical solution which internally leverages multiple analytic models to identify various anomalies/faults such as drift, rate of change, outliers, and so on. The models get trained on each sensor's historical data to record the learning and then deploy the learnt model to monitor the sensors.

Sensor Health does continuously monitor the configured sensors and provide the ability to generate alerts based on configured thresholds for various Sensor Health Index values in a near to real-time fashion. Those alerts get listed in a separate view. You can use the alert grid in Sensor Health to get additional information about the alert, navigate to a trend view, and provide feedback in case if you find many false positive or inaccurate alerts. In the trend view for the Sensor Health solution, the rendering of the trend can be overlaid with color codes to visually represent the probabilities of anomaly detection in the sensor data.

Operations Hub is at the core of the Sensor Health solution.


## Overview of Operations Hub

Proficiency Operations Hub is an end-to-end solution for developing, managing, and delivering applications to leverage the capabilities of big data analytics and the internet of things. Using Operations Hub, you can create applications that will collect and analyze data from a machine or a server, and trigger actions based on certain events. Operations Hub provides you with a user-friendly interface to create components of an application such as queries, database tables (called entities), events, email templates, users, and so on without the need to use your programming skills. You can also design pages and dashboards using these components.

Advantages of using Operations Hub:

- Operations Hub is quick, easy, and cost-effective. You do not need programming skills to develop an application.
- The Operations Hub applications use HTML5 and CSS3, and hence, they are platform independent.

- You can access an application using a computer or a mobile device.
- You can provide controlled access to an application and data based on user roles.
- You can create entities and queries for a relational database.

 **Note:** If you only installed the Operations Hub add-on for Historian, you cannot create, modify, or delete an application or a component of an application. You can only access the Historian analysis application.

## Limitations of Sensor Health

The following are some of limitations for the Sensor Health product:

- Supports up to 1000 sensors with/without additional hardware.
- Sensor Health will use additional tag in Historian to store sensor health index numbers. This tag will be counted towards your licensed tag limit.
- Proficy Operations Hub must already be installed before you install and use Sensor Health. Operations Hub's object model is a key requirement to make use of the Sensor Health configuration utility and to set it up.
- There is no provisioning for switching on/off various sensor failure modes.
- Sensor Health 1.0 cannot predict the expected values for the sensors.
- You cannot add new failure modes.
- Sensor Health 1.0 is not built for providing an out-of-the-box capability to extract clean data. However, it can be extracted from Historian by applying some conditions over Sensor Health index values.
- Resetting of the configurations in bulk is not possible Sensor Health 1.0, when configurations are done at sensors level.
- Dynamic alert messages are not part of the 1.0 release (that is: the message remains generic for warning and critical alerts as well as the common message; it is as per the user's input).

## Prerequisites

### Minimum Software Requirements

The minimum software requirements for the Sensor Health product are as follows:

- Proficy Operations Hub 1.7 or later. Operations Hub should already be installed and configured before you install Sensor Health.
- Proficy Historian 8.0 or later. Historian should already be installed, configured, and added as the data source in Operations Hub before you install Sensor Health.
- Proficy Historian Client Tools must be installed on the machine that Operations Hub is installed.

## Note:

- Typically, Historian and Operations Hub reside on different machines. CSense may reside on the same machine as Operations Hub. You may later choose to have CSense on another machine as well. (CSense is required. It will be installed by Sensor Health installer if it is not available.)
- Ensure that you have administrative privileges to the machine on which you want to install Sensor Health.
- There must be .Net Framework 4.7 or later versions installed on the server.
- The User need to have a license ready for the CSense that gets installed during the set up.
- The Operations Hub user with which the Installer is run should have the permissions to Create apps and plugins. If the Operations Hub user doesn't have this permission, the Operations Hub Posting Utility will fail to import the applications on Operations Hub.
- Microsoft SQL Express 2019 is a prerequisite before the Installation of the Sensor Health product begins. If this is not installed, during installation of product, the User will be prompted to install it separately to proceed further with the installation.
- You must have the Operations Hub client credentials, UAA credentials, and Historian credentials ready before you can begin the Sensor Health installation, as the you will be prompted to provide these details during the installation.
- Use the instructions in the Operations Hub and Historian documentation to install and configure those products.

Operations Hub documentation link:

<https://www.ge.com/digital/documentation/opshub/index.html>

Historian documentation link:

<https://www.ge.com/digital/documentation/historian/version80/index.html>

## Minimum Hardware Requirements

Sensor Health with 1000 sensors limit has similar requirements as Operations Hub:

- Minimum specification of 4 Core 2 GHz Processor with 16 GB RAM 2333 MHz
- Recommended 32G 2600MHz and an 8-core CPU 2Ghz –4GHz for better performance

## Supported Operating Systems

You can install the Operations Hub server on any of the following desktop operating systems:

- Microsoft Windows Server 2016
- Microsoft Windows Server 2019


## Supported Browsers

You can access Operations Hub using any of the following web browsers:

- Google Chrome (recommended)
- Mozilla Firefox
- Apple Safari

We recommend using a resolution of 1600 x 1200 for the browser. In addition, use a relatively modern device so that the browser has enough resources to render the visualizations and respond to user interactions with adequate performance. The following mobile device are supported for client access (end-app support only):

- iOS 12.0 or later
- Android 9.0 or later

 **Note:** We recommend using a device with medium to high resolution and landscape mode.



# Installation of Sensor Health


## What Comes with Your Installer

Sensor Health is an add-on product for Proficiency Operations Hub. The installer package consists of:

- Proficy CSense 7.1
- Postgres DB
- Services required for Sensor Health (Sensor Health and Alert Management micro-services bundled as a package)
- UI applications (for Configuration and Alerts)
- UI plugins

## Before You Begin

- Operations Hub and Historian are expected to be installed and configured as pre-requisite for Sensor Health package installation
- Operations Hub and Sensor Health are expected to be installed on the same computer
- Typically, Historian and Operations Hub reside on different machines. CSense may reside on the same machine as Operations Hub. You may later choose to have CSense on another machine as well. (CSense is required. It will be installed by Sensor Health installer if it is not available.)
- Ensure that you have administrative privileges to the machine on which you want to install Sensor Health
- There must be .Net Framework 4.7 or later versions installed on the server/computer
- The User needs to have a license ready for the CSense that gets installed during the setup
- The Operations Hub user with which the Installer is run should have the permissions to Create apps and plugins. If the Operations Hub user doesn't have this permission, the Operations hub Posting Utility will fail to import the applications on Operations hub.
- MS SQL Express 2019 is a prerequisite before the Installation of the Sensor Health product begins. If this is not installed, the User will be prompted to install it separately to proceed further with the installation.

 **Important:** You must have the Operations Hub client credentials, UAA credentials, and Historian UAA credentials ready before you can begin the Sensor Health installation, as the you will be prompted to provide these details during the installation.

## Steps to Install

Use the following steps to install the Sensor Health product on top of a pre-existing Operations Hub install.

1. Run the Sensor Health installer file that came with your installation package. The Welcome screen appears as shown in the following graphic.

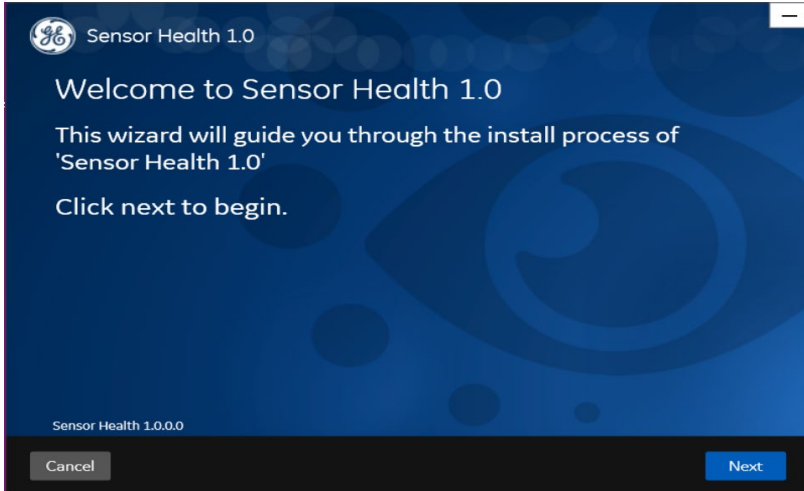


Fig 1

2. Select Next. If the installer is unable to find Trusted Root Certificates, the following dialog box appears. Select the check box to proceed.

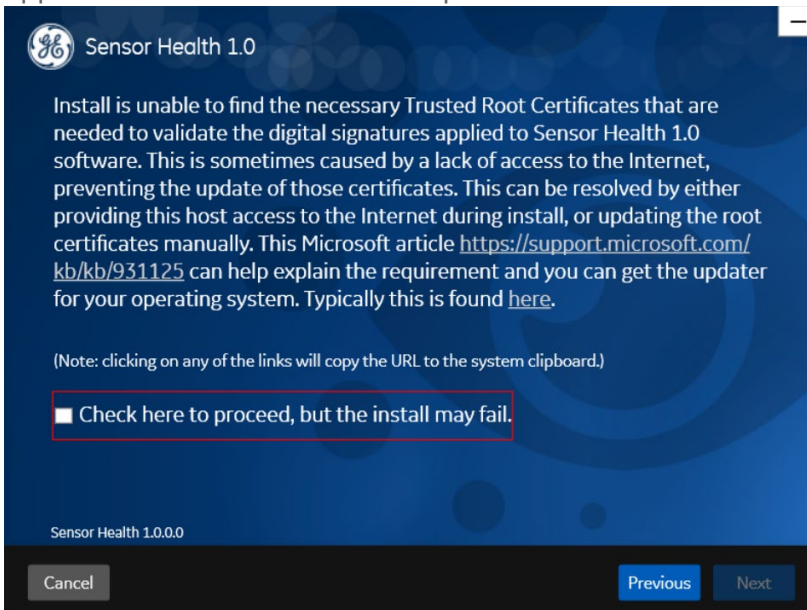


Fig 2

3. Select Next. The license agreement appears. To continue, select the Accept check box and click Next to proceed.

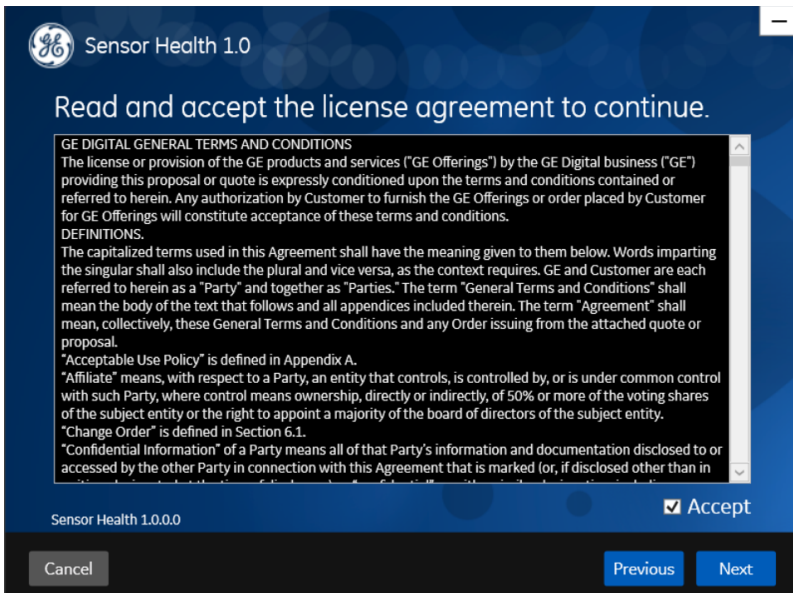


Fig 3

4. Since CSense will be installed as part of this installer, if SQL Express is not available on machine, message with a link to download is provided. Download and install if required.

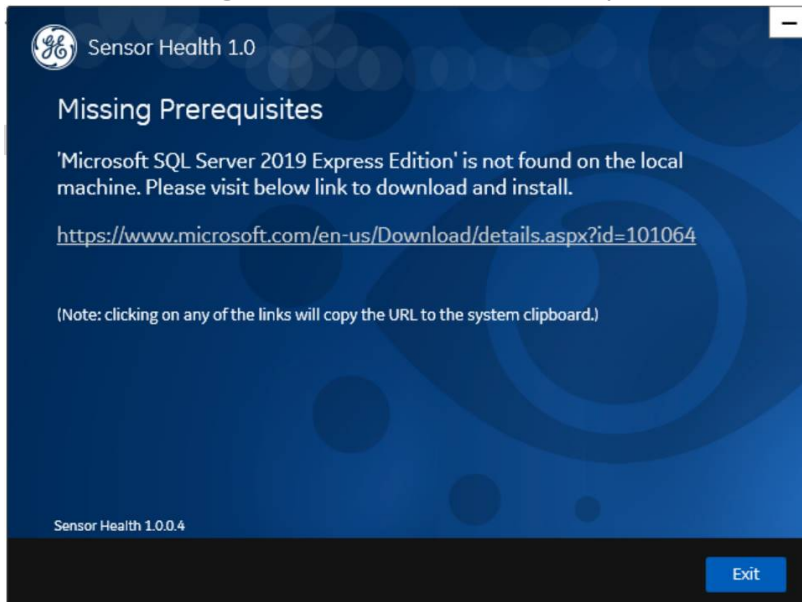


Fig 4

The prerequisites wizard appears to check if the necessary software is installed and provides the status of the same.

5. Click Next to proceed.

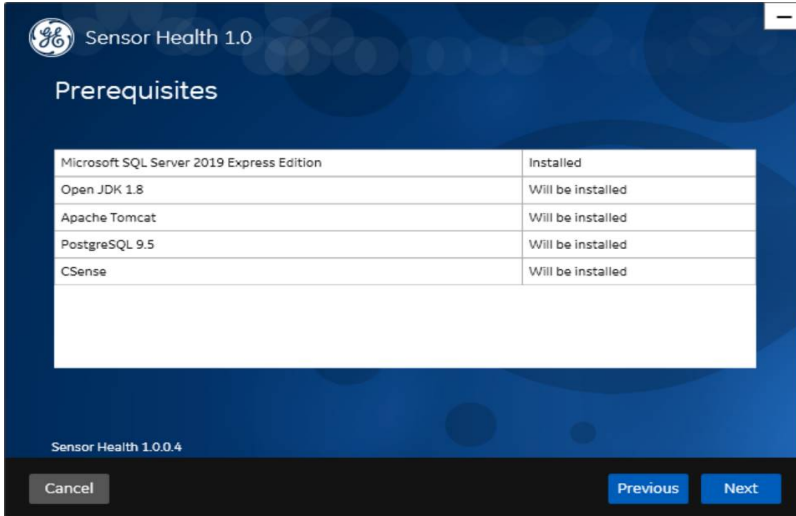


Fig 5

The Operations Hub Configuration screen appears.

6. Provide the host name details and click Next.

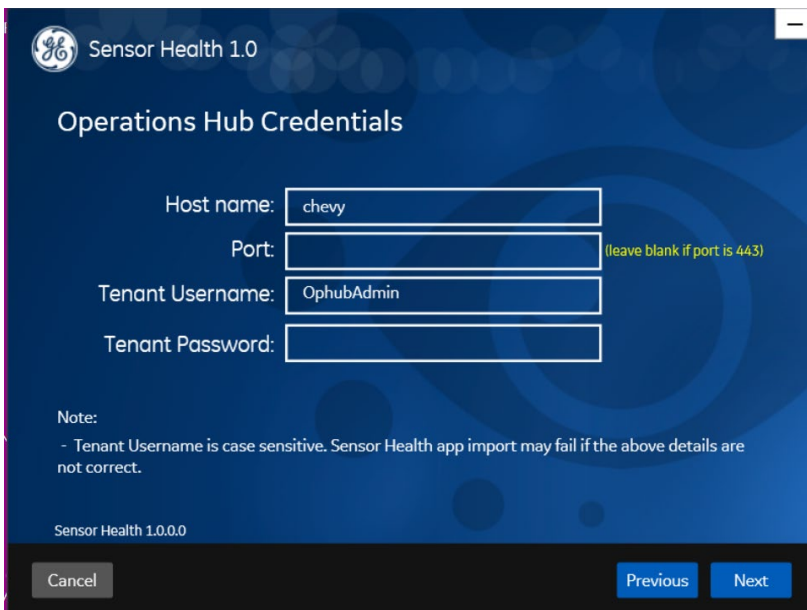


Fig 6

The installation directory details wizard for the Sensor Health appears.

7. Provide the necessary directory details and click Next.

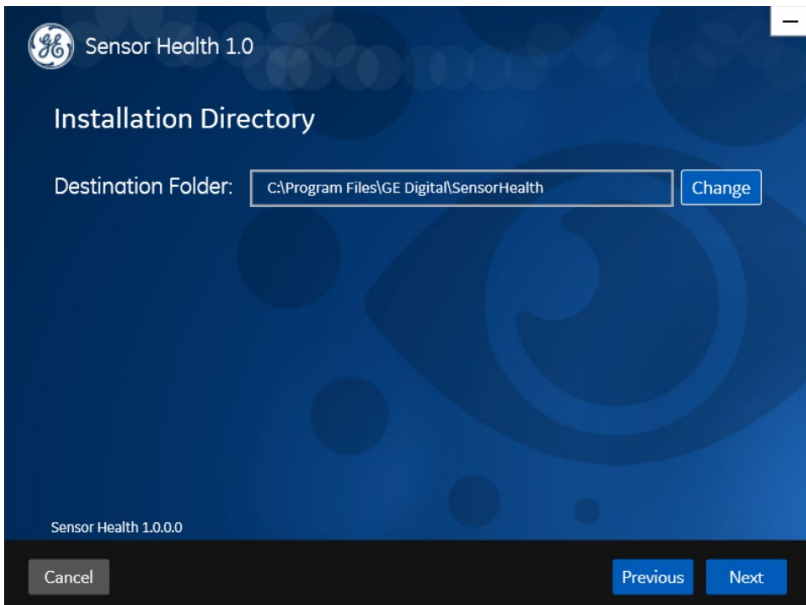


Fig 7

8. Enter the UAA credentials and click Validate to check if the credentials provided are correct. After validation, click Next.

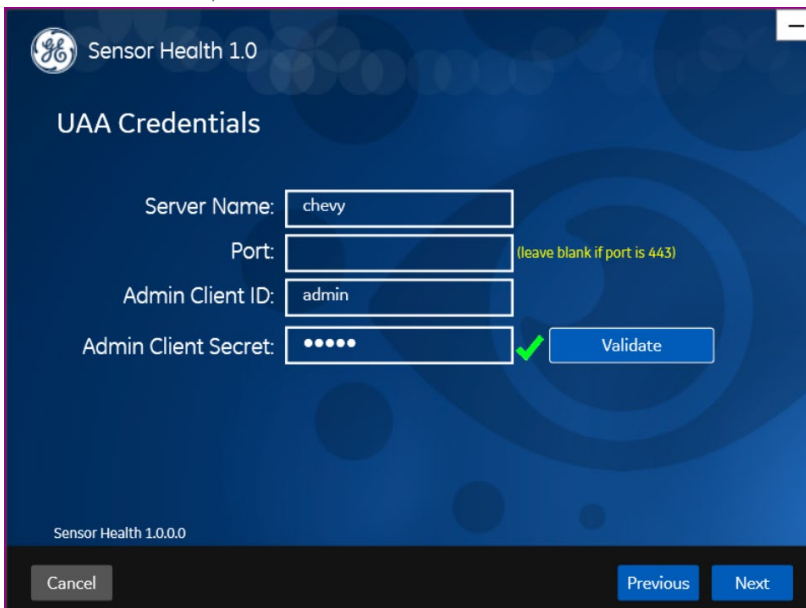


Fig 8

9. Provide the Historian UAA credentials and validate. After the credentials get validated, click Next.

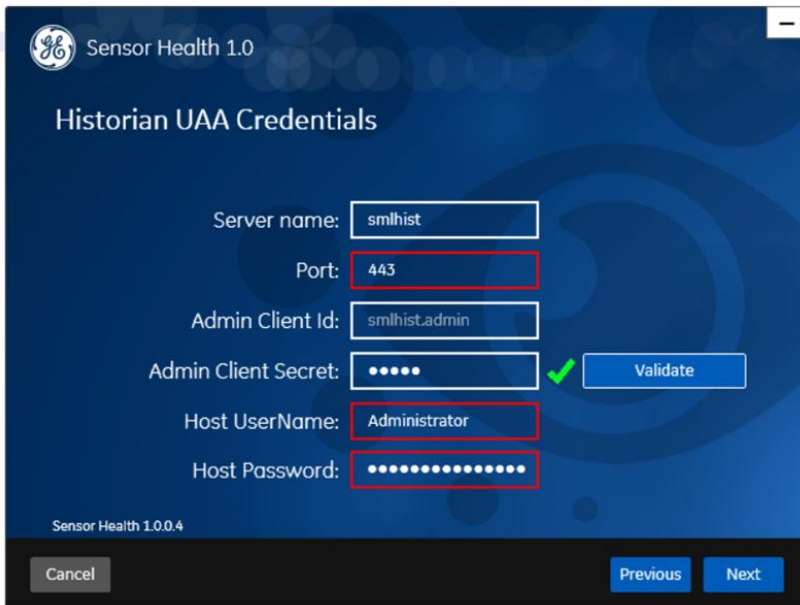


Fig 9

10. If the Tomcat is not already installed, following wizard appears. Provide the Tomcat installation details and click Next. If the Tomcat is already installed, proceed to Step 11.

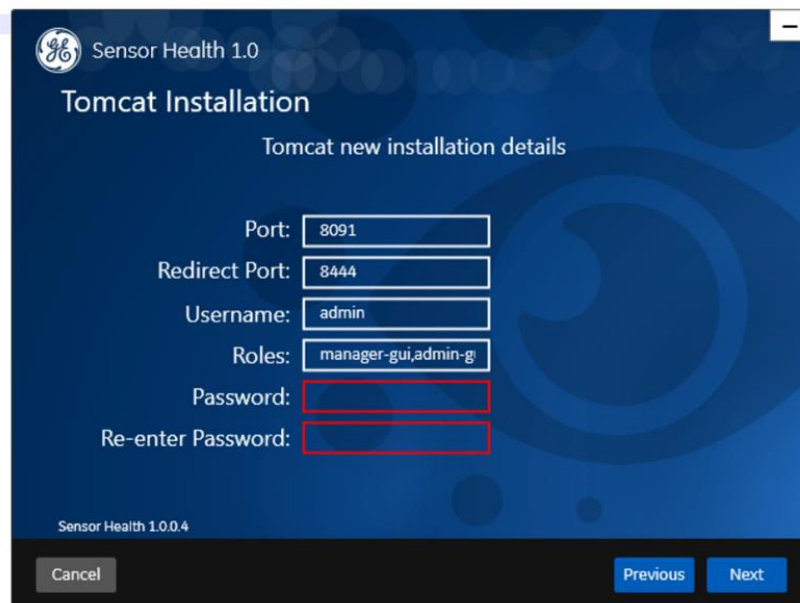


Fig 10

11. If the Tomcat is already installed, the following wizard appears to select the Tomcat instance. Click OK and select the appropriate instance. Else proceed to PostgreSQL installation in Step 13.

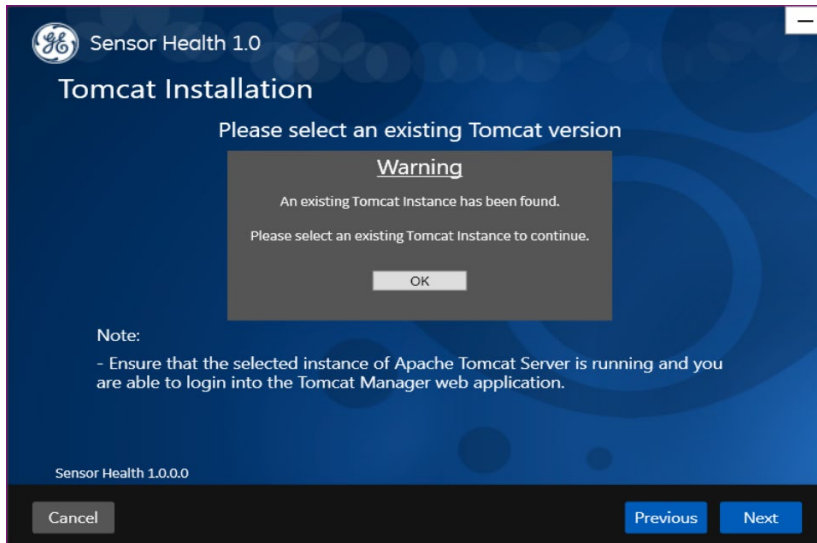


Fig 11

12. Select the existing Tomcat instance and click Next.

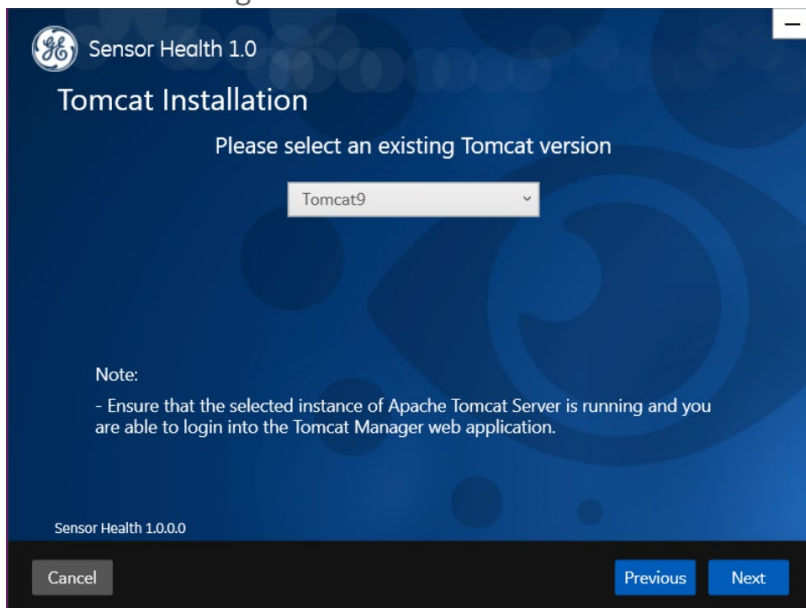


Fig 12

13. If the PostgreSQL is not already installed, the following wizard appears. Provide the PostgreSQL installation details and click Next.



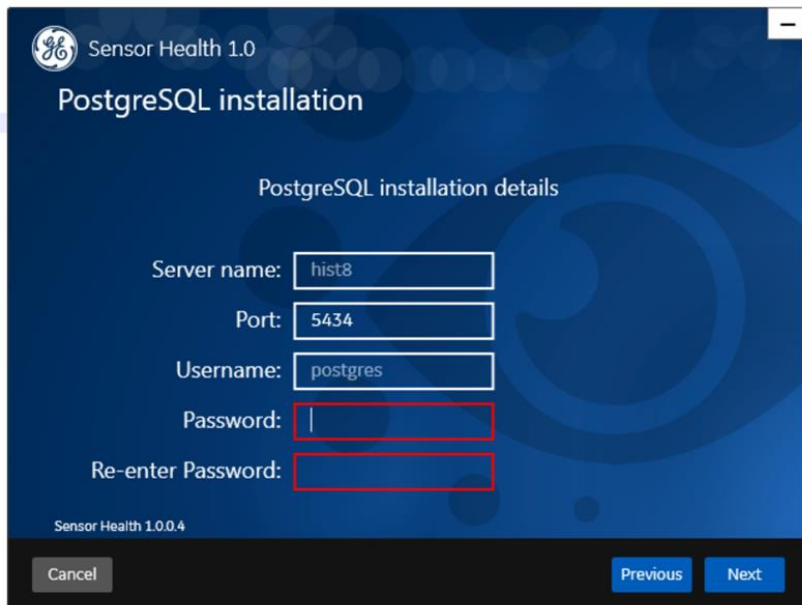


Fig 13

14. On the "You are ready to install" details screen, click Install to proceed.

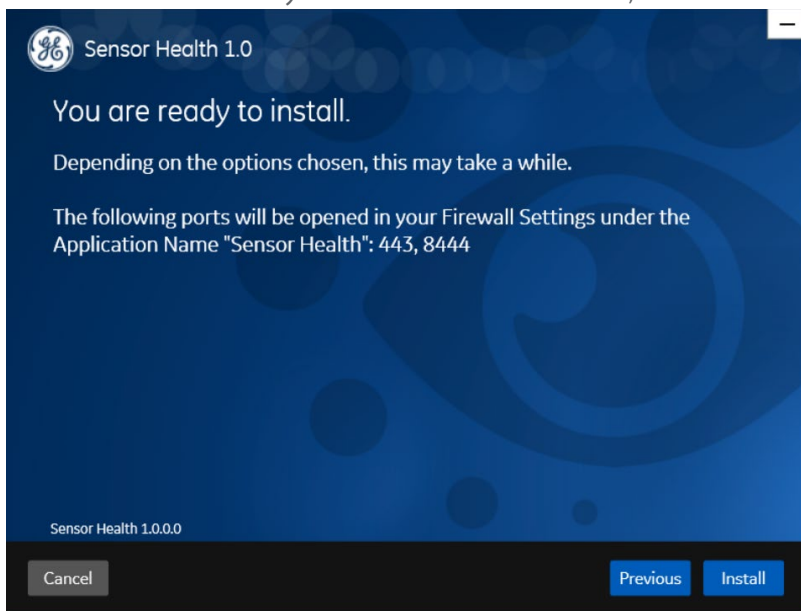


Fig 14

15. Observe the installation progress.



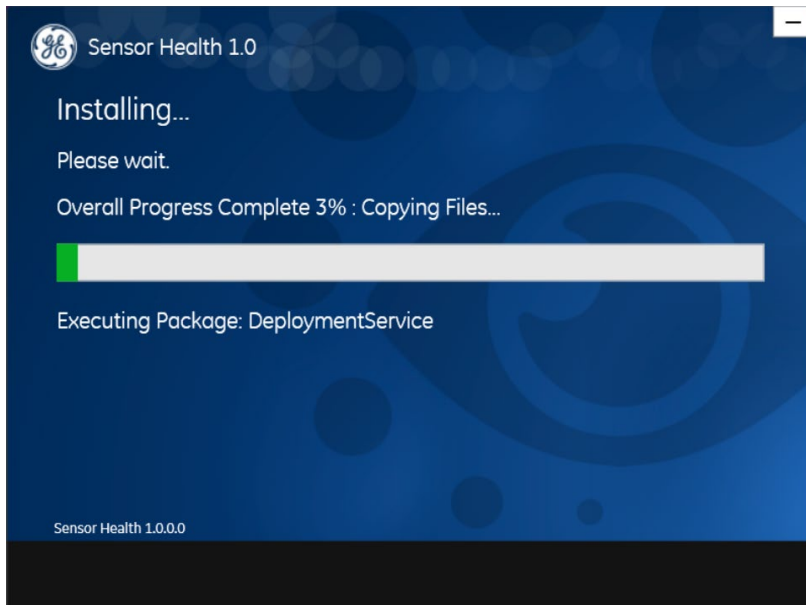


Fig 15

16. When the screen appears indicating that the installation is complete, click Exit

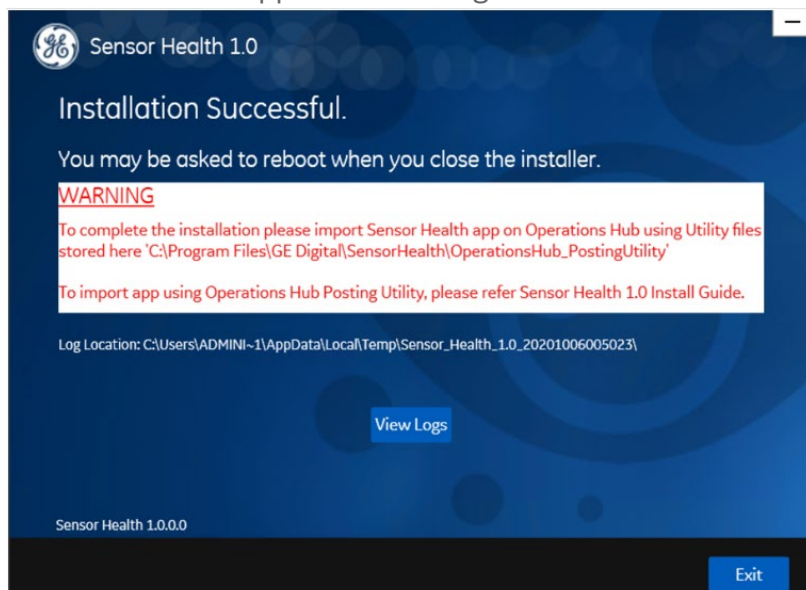


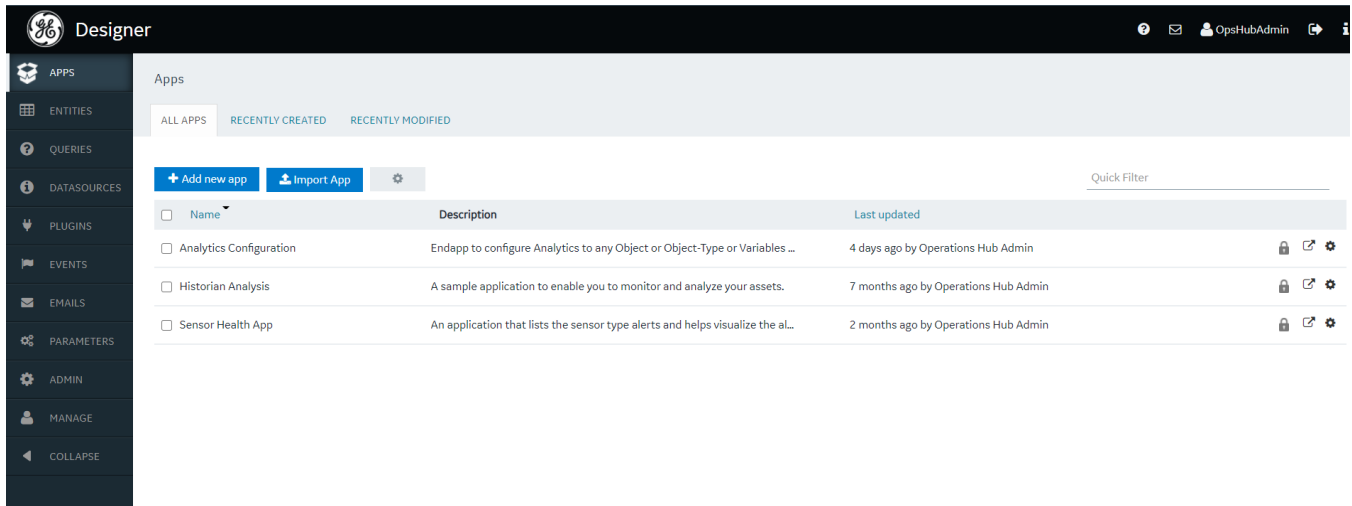
Fig 16

17. After the Sensor Health app installation is successful, complete the import of the applications: in the Command Prompt, navigate to the OperationsHub\_PostingUtility folder specified in the Successful Installation window above.
18. Run the installwebcomponents.cmd file.
19. Provide the Operations Hub client credentials. The Posting Utility will begin importing all the applications to Operations Hub.

# App Configuration

After the Sensor Health is installed, the following applications must be configured:

- Analytics Configuration application
- Sensor Health application



**Note:** The admin user can view both the Application as shown in the above snapshot. Other users will be able to see the appropriate applications depending on their access rights.

## Analytics Configuration Application

Analytics Configuration application is a screen to configure analytics and alerts for different sensors, objects and object-types at different levels. This application is used by administrative group to configure a set of values. This is the starting activity that you must perform to get sensors enabled for monitoring. This application can be restricted to an administrative group on the Operations Hub install itself. Detailed documentation on the process to configure analytics and alerts at different levels of the Object Model is available on the Sensor Health User Guide.

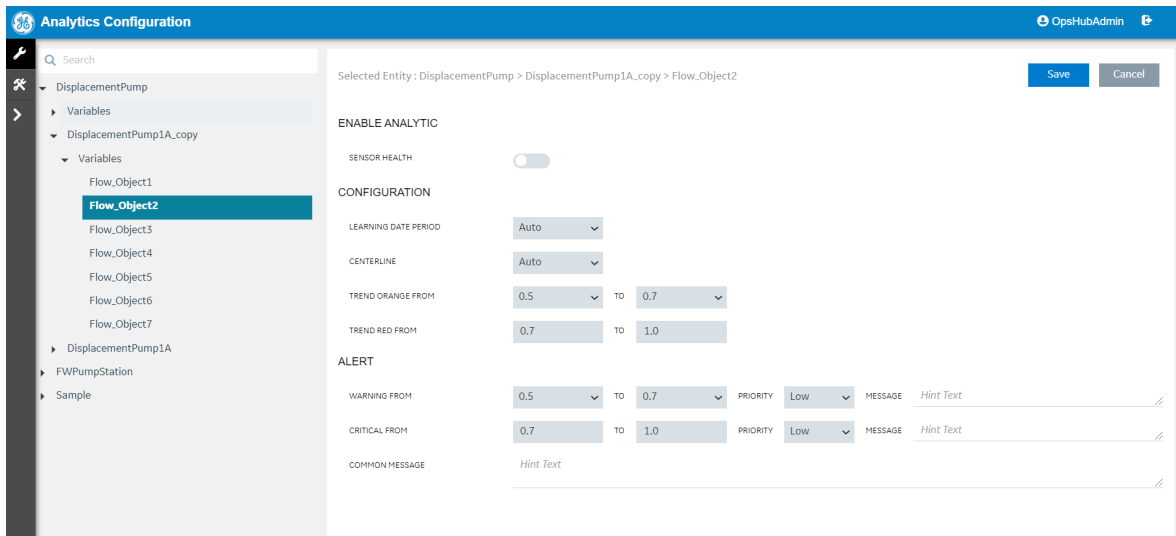


Fig 17

Analytics Configuration application contains two screens (administrator can manage who can access this application).

- Configuration Screen – This screen allows user to configure the system in order to get sensors enabled for monitoring. It allows enabling Sensor Health analytics and create new configurations, edit existing configurations, and disable Sensor Health analytics for any given level.
- Deployment Report Screen – This screen is a central location where all the Sensor Health analytics configured on the Analytic Configuration screen gets listed in a grid with the status of their deployment.

## Sensor Health Application Configuration

The Sensor Health application launches the alerts screen to view all the alerts that are generated and includes navigation to Trend Analysis for each of the alerts that are generated. Detailed documentation on the different functionalities provided by this application is available on the Sensor Health User Guide.

SEVERITY	ALERT ID	TIMESTAMP	PRIORITY	CLASSIFICATION	TAG	OBJECT	MESSAGE	ACTIONS
critical	15	7/24/2020, 8:10 AM	High	alertDetails	Flow_Object4	DisplacementPump1A	message	<a href="#">link</a>   <a href="#">info</a>
critical	30	7/24/2020, 9:04 AM	High	alertDetails	Flow_Object4	DisplacementPump1A	message	<a href="#">link</a>   <a href="#">info</a>
critical	45	7/24/2020, 9:06 AM	High	alertDetails	Flow_Object4	DisplacementPump1A	message	<a href="#">link</a>   <a href="#">info</a>

Fig 18

The Sensor Health application contains two screens (administrator can manage who can access this application).

- Alerts Screen - The Alert Screen is a central location where all the alerts generated by Sensor Health analytics get listed in a grid view and have some interaction with it.
- Visualization Screen - The Trend view (Visualization) screen comes with a feature of displaying the trend line color, based on the Sensor Health Index values.

## Managing Permissions to User Groups

Assigning each application to different User Groups can be done in Operations Hub to restrict applications to view by set of Users only.

### Creating a new User or Role

1. Confirm that the following screen (or similar) appears after you login to Operations Hub:

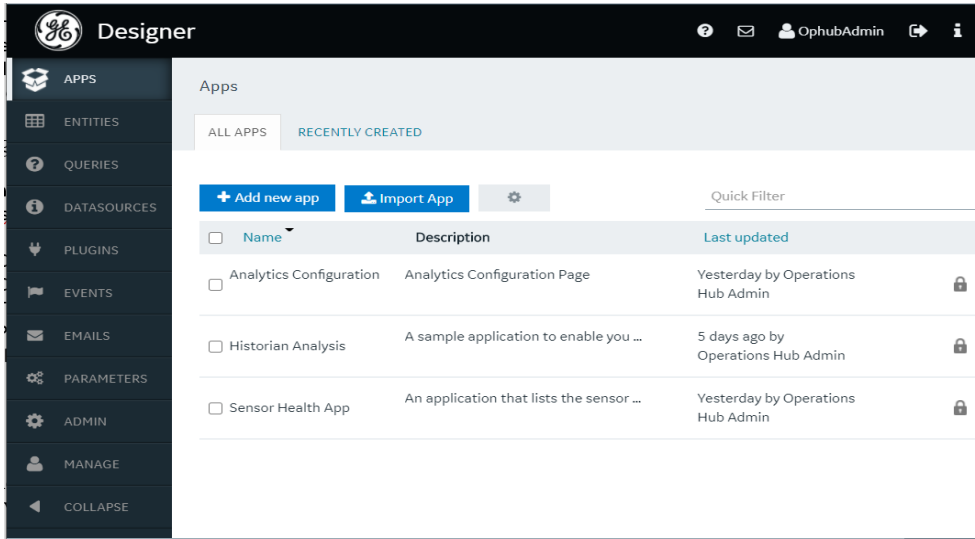


Fig 19

2. Click Manage in the left navigation to create any new User or Role.

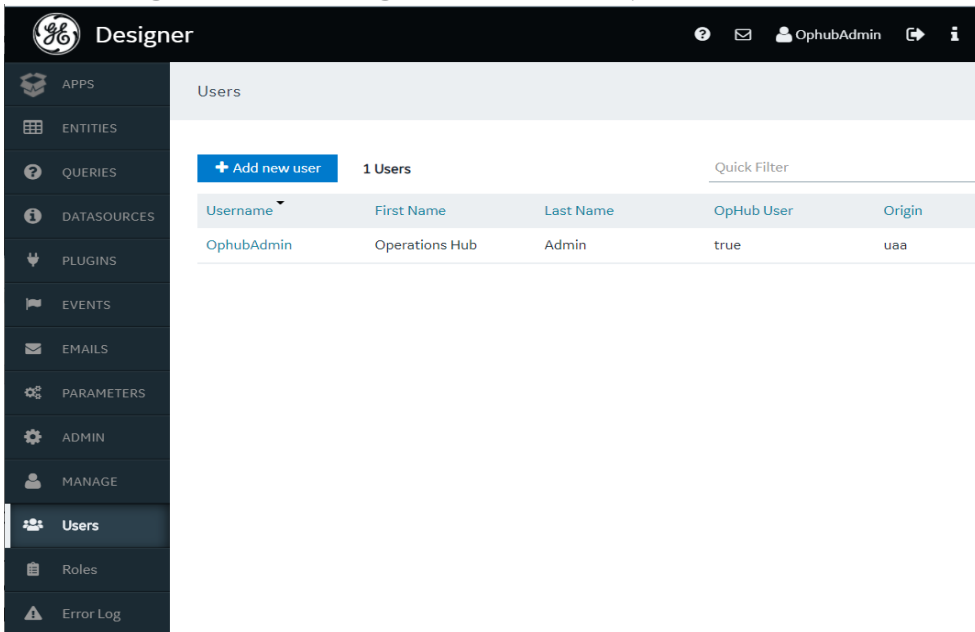


Fig 20

3. To create a new user, click on “Users” and then click “Add new user”.
4. Provide all the required details and assign the user to one or more User Groups from the dropdown menu.
5. Click Create.

**New Account** ✕

Username  
\_\_\_\_\_

E-mail  
\_\_\_\_\_

First Name  
\_\_\_\_\_

Last Name  
\_\_\_\_\_

Password  
\_\_\_\_\_

Repeat Password  
\_\_\_\_\_

Groups  Only GE groups

Fig 21

\_\_\_\_\_

Last Name  
\_\_\_\_\_

Password  
\_\_\_\_\_

Repeat Password  
\_\_\_\_\_

Groups  Only GE groups

Select UAA groups...

- iqp.clouduser
- webhmi.user
- iqp.user
- webhmi.administrator**
- iqp.developer

Fig 22

# Assigning User Permission to Applications

1. Click on the application name which you would like to open on the main page of Operations Hub. The application will open.

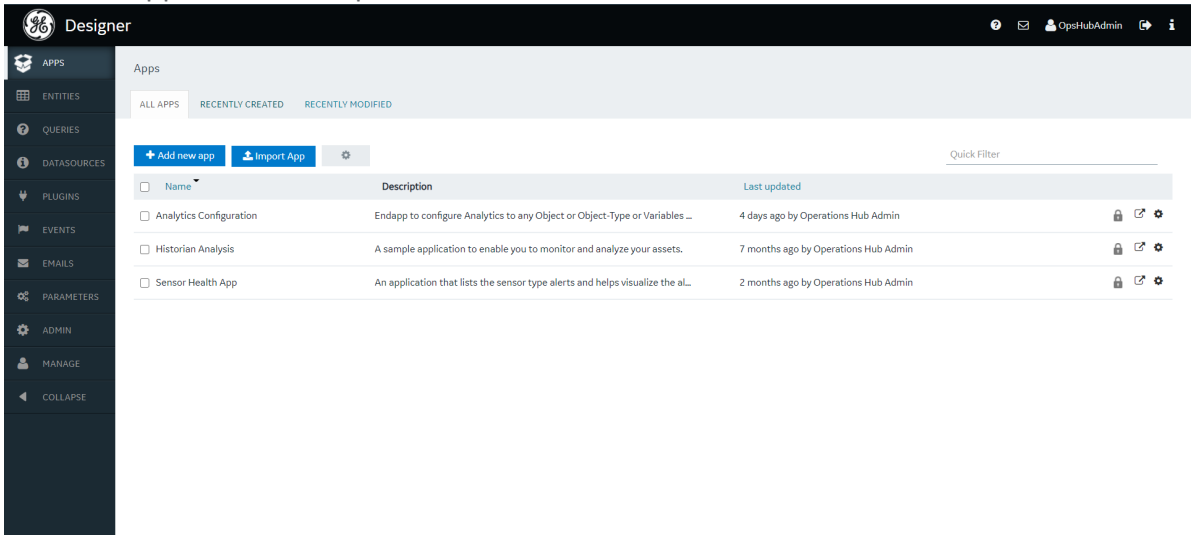


Fig 23

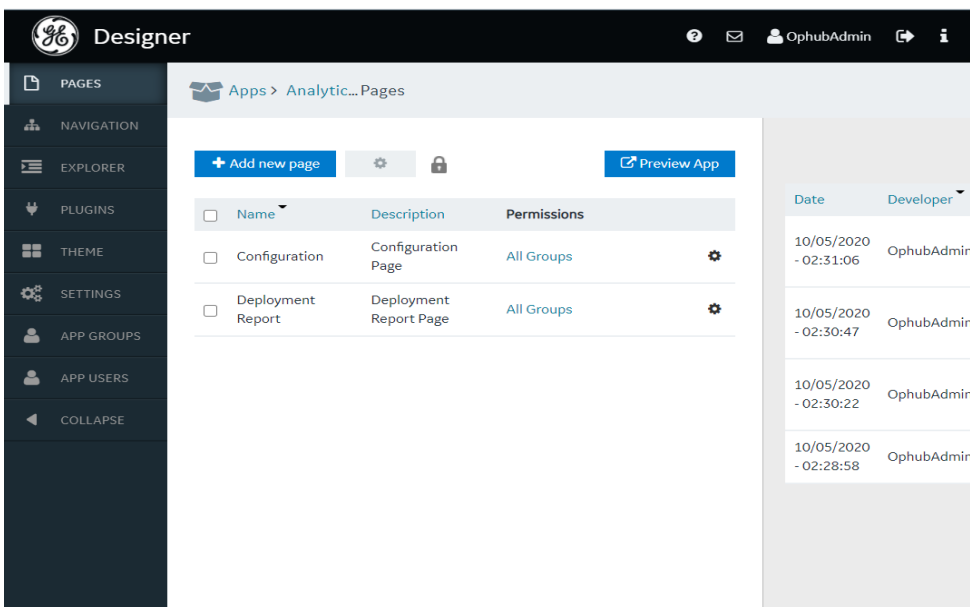


Fig 24

2. For setting up same permission across all the pages, click on "APP GROUPS" or "APP USERS" in the left navigation and add the desirable Users or Groups. Select or unselect any App Groups or App Users and then click Submit Changes to add/remove the permissions across the entire application.

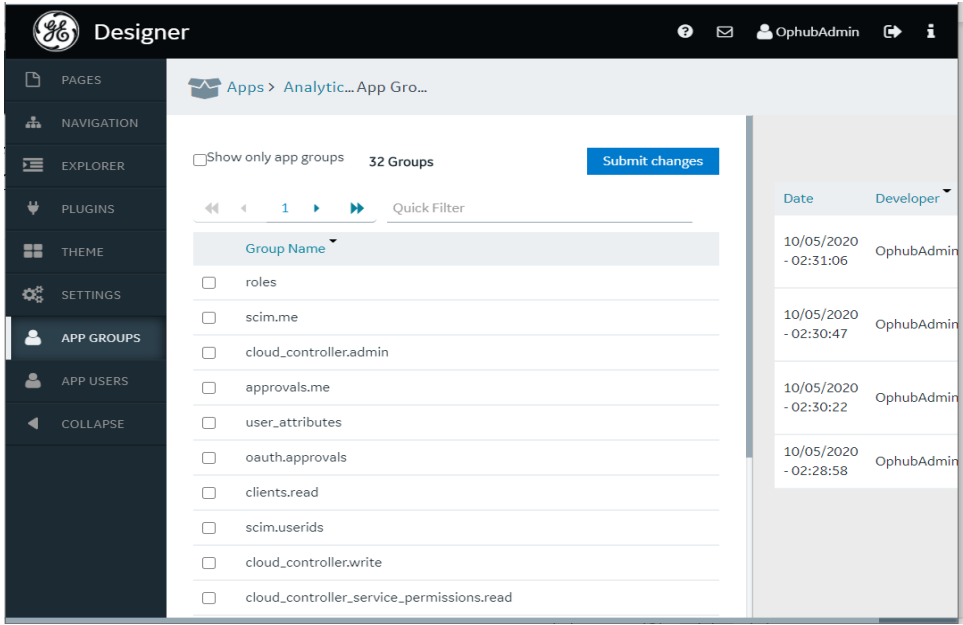


Fig 25

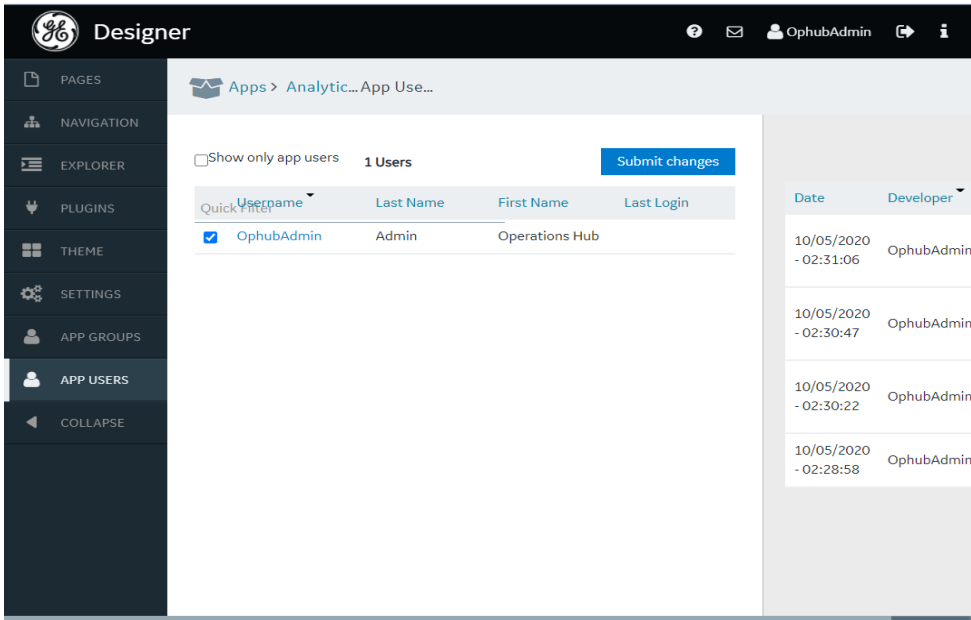


Fig 26

- To manage permissions to a specific set of pages, select the permissions column for that page (Fig 27) and assign 'All Groups' or 'Selected Groups' and select set of groups from the drop-down and click on Save Permission.



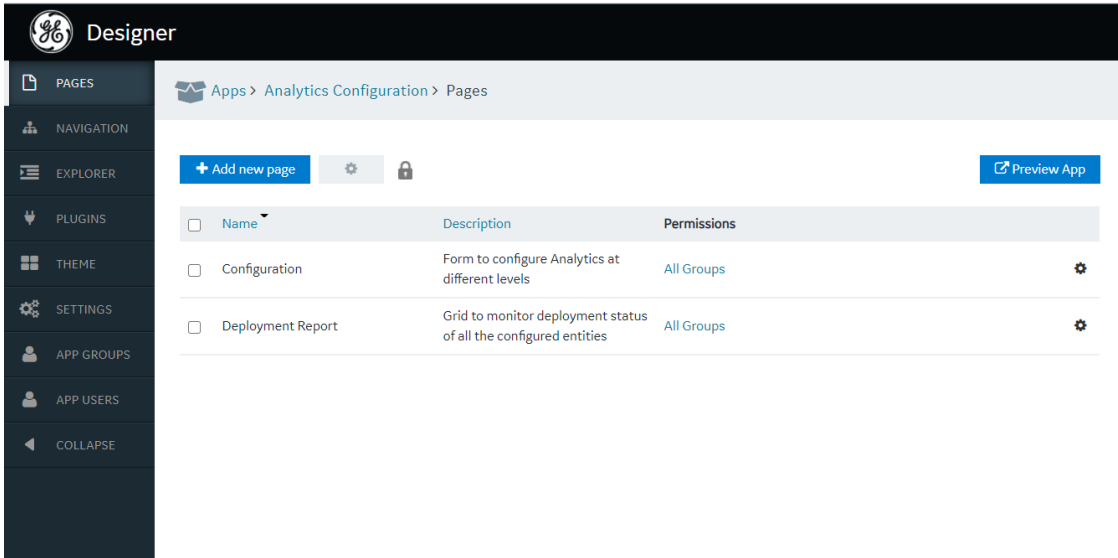


Fig 27

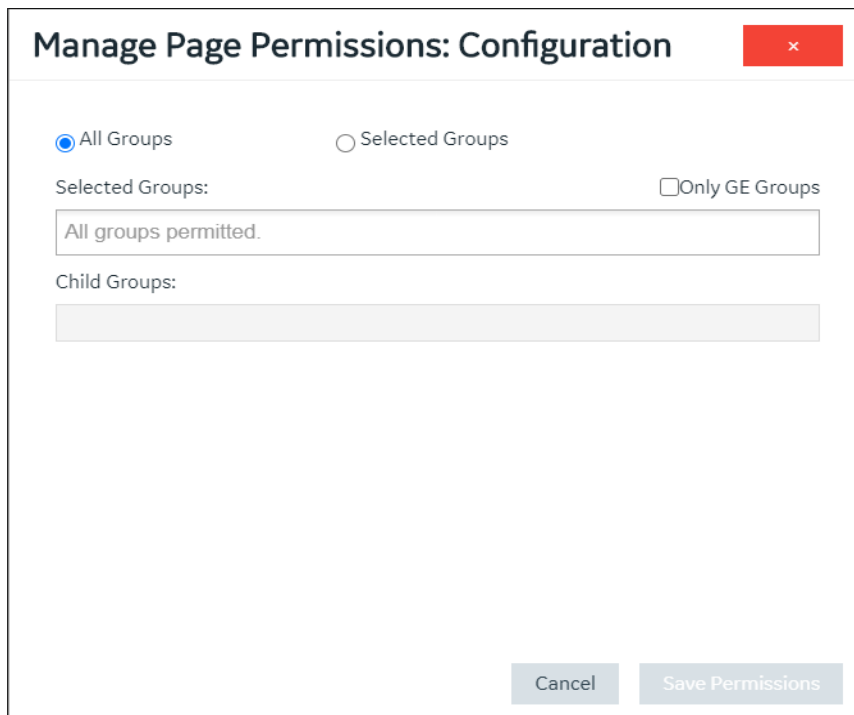


Fig 28

# Troubleshooting

## Logging

The logs for all the microservices are stored in the logs folder of the installed C:/<Tomcat installation>/bin/logs.

Logs related to the Sensor Health Installer are stored in system's directory. For example: C:/Users/<user>/AppData/Local/Temp/Sensor\_Health\_<version> folder.

## Common Errors and Troubleshooting

- After the successful installation wizard of the Sensor Health product, it is necessary to run InstallWebComponents.cmd within OperationsHub\_PostingUtility folder specified in the successful Installation wizard to import the Application and Plugin to Operations Hub as stated in the Step 17 of installation guidelines. This step is necessary to import the end applications and plugins into Operations Hub.
- When the InstallWebComponents.cmd file is executed on Command prompt, it might result into two results.
  - (i) Successful posting of the End Applications and plugins to Operations Hub.
  - (ii) Error Importing the Apps.

The 'App Import Failed' error might occur, if the user doesn't have the permission to create Apps on Operations Hub.

Also, the Error might also be if the Operations Hub is not on Premium Version. Run the premium convertor so that Operations Hub gets access to create Applications.

- If the Proficy Historian Client Tools are not installed, you might get an error while connecting the Historian data source.

Proficy Historian Client Tools are necessary to connect to the Historian data sources by the Historian APIs. If this is not installed, the Configuration Analytics Application will error out as it won't be able to fetch tag data for any of the variables.

- You might get an 'Unable to Deploy Analytics' error on the configuration side if CSense is not working. Make sure a valid license is activated for the CSense that is installed.

CSense is responsible for running any analytics in the background.

- If the Applications error out on UI with a notification that 'Backend Services might be down', try restarting the Tomcat services in the 'Services.msi' section.



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